Bangladesh J. Fish. Res., **1**(2) : 31-38 July 1997
Bangladesh Fisheries Research Institute

Some aspects of association and development of *Lytocestus indicus* Moghe in catfish *Clarias batrachus* (Lin.)

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Abstract

Some aspects of association and development of the caryophyllid cestode *Lytocestus indicus* Moghe, 1925 infecting the catfish *Clarias batrachus* (Linn.) from the Kailla Beel of Mymensingh, Bangladesh were studied. About 33.14% of *Clarias batrachus* were infected with a mean intensity of 3.75, mean density 1.25. The infection was not found throughout the year. Two seasonal occurrence of this cestode were observed, one in April-May and the other in August-September. However, maturation period of the worm coincided with the maturation of the host. The worm was found attached to the wall of the intestine of the host. At the site of attachment tissue layers were compressed due to machanical injuries. Prevalence and mean intensity of infection increased with length groups. No variation in infection was significantly observed in different sexes of the host examined.

Key words : *C. batrachus, Lytocestus indicus*

Introduction

Seasonal cycle in prevalence and maturation have been observed in few species of caryophyllid cestode in fishes (Calentine and Fredickson 1965, Kennedy 1968, 1969, Zaman and Leong 1988). *Lytocestus indicus* a caryophyllid, was first recorded by Moghe in 1925 from *Clarias batrachus* (L.). Since then, it has been reported in this catfish from other South East Asian countries. Ahmed and Sanaullah (1976) first reported this helminth in Bangladesh . Later they (Ahmed and Sanaullah 1977, Sanaullah and Ahmed 1979) also studied the associations, distribution and pathogenecity of the parasite with other helminths from the same host. As partial information on seasonal association of their species were provided by Rashid *et al.* (1983) and

Zaman and Leong (1988), this paper therefore gives a detailed account of infection and developmental stages of *Lytocestus indicus* in its final host the *Clarias batrachus* of Kailla Beel in Mymensingh.

Materials and methods

Fish samples were collected from the Kailla Beel, Mymensingh by cast net during October '94 through September '95. Twenty specimens of *Clarias batrachus* were targeted to sample in every month. They were brought in a container with water. Total length and sex of the hosts were noted. The host fishes were classified into three groups on the basis of their total length. The fish were opened ventrally by a sharp scalpel. Whole gut was removed, measured and opened in physiological saline. Position of the *Lytocestus indicus* was noted by measurement of the gut, small worms were searched by scraping out mucus using dissecting microscope. All the worms were collected, released in water and counted. Some worms were fixed in A.F.A. stained in Alum carmine, dehydrated in alcohol grades and prepared permanent slides for determining the state of maturity. The worms were classified into four groups on the basis of their development (immature- early larval stage, sex organs not developed; maturing- sexual organs distinct and developing; mature- sexually mature, not fertilized; gravid- gravid worms containing fertilized eggs in them). Data on the number, size and developmental state of worms collected from each fish were recorded and analyzed.

Results

Seasonal occurrence in prevalence and intensity of infection

A total of 175 specimens of *Clarias batrachus* were examined during the period from October '94 to September '95 and 218 *Lytocestus indicus* were collected from 58 fishes. This presented an overall prevalence of 33.14% and intensity 3.75 worms.

The occurrence, prevalence and intensity of *L. indicus* in *C. batrahus* is shown in Table 1. The worm occurred throughout the year but in varying intensities. Over the period of 12 months, the prevalence was higher during December-September and varied from 2.70 to 55.56%. However, maximum prevalence was in August-September when 55.56% fishes examined harboured the worm. The infection was minimum in October-November when 2.70% of the examined fish were infected. In other period the prevalence ranges between 15-50%.

The highest intensity (an average of 5.54 worms per infected host) was recorded in April-May. The lowest intensity was recorded (only one parasite per host) during October-November. In the remaining period the intensity varied between 1.62 to 3.1.

Table 1. The occurrence of prevalence and intensity of *Lytocestus indicus* in *Clarias batrachus*

Sampling period	No. of fish examined	No. of fish infected	Prevalence (%)	Mean intensity per infected fish	Mean density per examined fish	Variance / Mean
Oct/Nov	37	01	2.70	1.00	0.03	1.00
Dec/Jan	37	13	35.14	3.92	1.37	4.58
Feb/Mar	20	03	15.00	1.62	0.25	2.05
Apr/May	29	13	44.83	5.54	2.48	5.46
Jun/Jul	16	08	50.00	3.25	1.62	2.53
Aug/Sep	36	20	55.56	3.10	1.72	2.54
Total	175	58	33.14	3.75	1.25	4.51

Infection in relation to sex and size of the host

Data relevant to the host-sex and distribution of *L. indicus* is given in Table 2. Out of 92 males and 83 females; 28 male and 30 female fishes were infected. The ratios differ and it is evident that parasites burden in females is heavier than that of males. But statistically no significant variation in intensity were observed between male and female fishes ($T_{0.10}$=1.564 with d.f.10). The prevalence was not found significant among different sex fishes ($T_{0.10}$=0.682 with d.f.10). The level of infection in male and female fish fluctuated in different months. In June-July and August-September highest infection (50%) were recorded in males and females highest infection (62.50%) were recorded in August-September. However, lower infection was found in females in October-November. Thus both the prevalence and intensity of infection appeared higher in females. But in June-July males and females were infected to the same level.

The results of host-size relative data in *L. indicus* are shown in Table 3. All size groups of fishes were infected and largest size group also appeared to be more susceptible. The decline of prevalence are found in smaller fishes. But the prevalence was not found significant among different size groups of fishes (F_5=3.17 with d.f.2,10). However, there was a relationship between the mean parasite burden and the size of the fish. It varies significantly (F_5=7.83 with d.f.2,10) with the size groups. It is evident that the fish accumulate more parasites as they grow in size.

Table 2. The occurrence of prevalence and intensity of *L.indicus* in male and female *C. batrachus*

Sampling period	No. of fish examined		No. of fish infected		Prevalence (%)		Mean intensity		Mean density	
	M	F	M	F	M	F	M	F	M	F
Oct/Nov	17	20	00	01	-	05.00	-	1.00	-	0.10
Dec/Jan	20	17	06	07	30.00	41.81	3.17	4.57	0.95	1.88
Feb/Mar	11	09	01	02	09.00	22.22	1.00	2.00	0.09	0.44
Apr/May	14	15	06	07	42.86	46.67	3.83	6.71	1.64	3.33
Jun/Jul	10	06	05	03	50.00	50.00	3.00	3.67:	1.50	1.83
Aug/Sep	20	16	10	10	50.00	62.50	2.30	3.90	1.15	2.43
Total	92	83	28	30	30.43	36.14	2.89	4.57	0.88	1.65

Table 3. occurrence of *Lytocestus indicus* in three size groups of *C. batrachus*

Length groups (cm)	No. of fish examined	No. of fish infected	Prevalence (%)	Mean Intensity
<22.5	56	15	26.79	3.13
22.5-23.5	61	18	29.51	3.39
> 23.5	58	25	43.10	4.40

The developmental stages of L. indicus

The development and maturation of the worm has been studied by the monthly distribution of immature and mature worms. The pattern of variation in infection of the population structure of the worm in the host are shown Fig.1. All four groups were not present in October-November, February-March and August-September. However, in these months reproduction did not take place. Maturing and mature worms make up the larger part of the population during most part of the year may be due to the greater duration of these two stages. Recruitment indicated by the presence of immature worm in the fish gut appears to take place from December to September. However, after September recruitment does not take place. The presence of higher proportion of larval worms in December-January indicates that the peak recruitment occurred during this months. Seasonal occurrence in the arithmatic mean of larvae (immature) and gravid worms are shown in Fig. 2. The mean number of immature worm shown a seasonal pattern with maximum abundance in autumn (April-May) and no larvae in October-November. The increase of mean number of larvae in autumn is however, to be an effect of highest number of gravid worms in late summer.

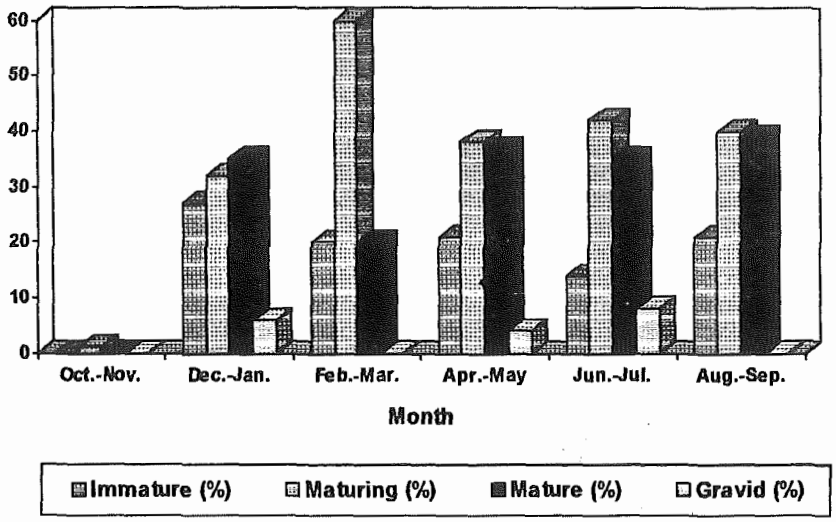

Fig. 1. Seasonal occurrence of immature, maturing, mature and gravid worm of *Lytocestus indicus in Carias batrachus.*

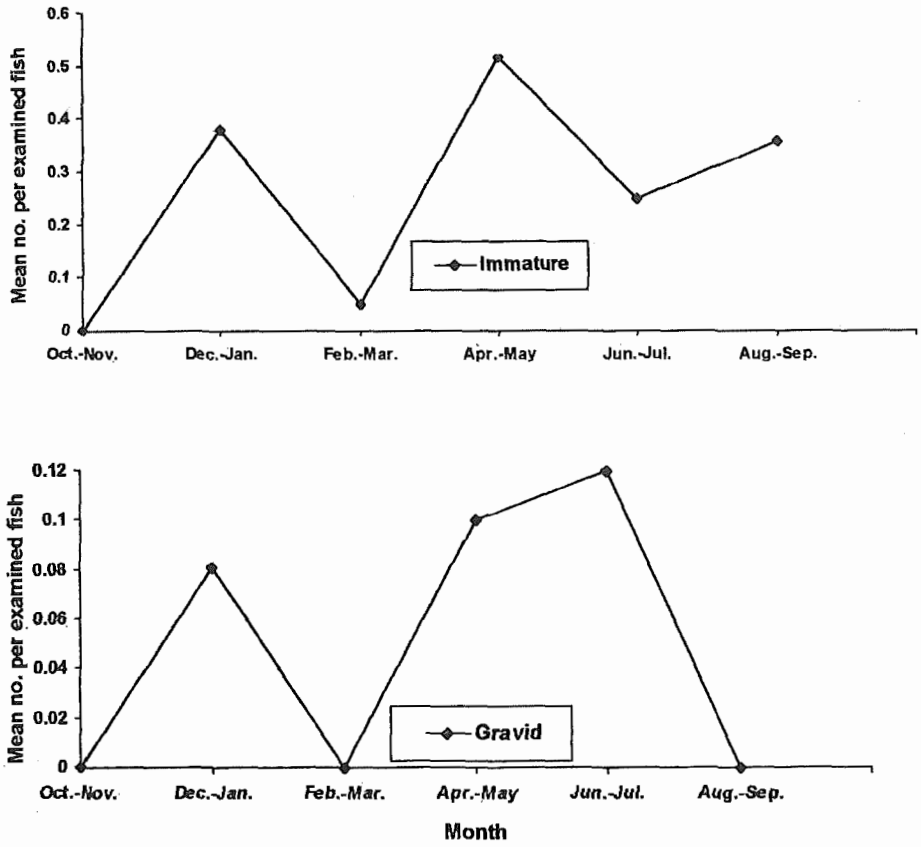

Fig. 2. Seaonal occurrence in the arithmatic mean of larvae (immture) and gravid worms of *Lytocestus indicus* in *Clarias batrachus.*

Discussion

The caryophyllid cestode, *Lytocestus indicus* was first recorded in *Clarias batrachus* by Moghe (1925, 1931). Since then various species of this genus *L. parvulus* Furtado 1963, *L. birmanicus* Lynsdale 1956, *L. filiformis* (Woodland) Fuhrman and Baer 1923, *L. fossilis* Gupta 1961 and *L. logicollis* Ramadevi 1973 have been described from silurid fishes from Indian subcontinent. Chandra and Khatun (1993) described *Pseudocaryophyllaeus heteropneustus* a new cestode from *Heteropneustes fossilis* from Mymensingh.

Seasonal occurrence in prevalence and intensity of *L. indicus* were found to be higher in August-September. Satpute and Agarwal (1980) found the similar seasonal infection in *C. batrachus* in six different tanks at Raipur, India. Niyogi *et al.* (1982) also reported very high incidence in intensity and density during March to August in *C. batrachus* of five species of caryophyllids, *viz. Lytocestus indicus, Pseudocaryophyllaeus indica, Djombangia penetrans, Introvertus raipurensis* and *Lucknowia indica.* Recruitment of these species of worms corresponded with the spawning season, when the fish were under tremendous stress, both hormonal and environmental. Agarwal (1985) mentioned that the infection was heavy during spawning of fish from March to August being recruitment season. Ahmed *et al.* (1985) also observed the highest rate of infection in *C. batrachus* by *L. indicus, Bovienia serialis* and *Pseudocaryophyllaeus indica* in rainy season.

In relation to the prevalence and level of infection were found to be relevant in different sexes. The present study indicated that the caryophyllid cestode, *L. indicus* showed higher infection in female than male hosts. Similar observations were made by Niyogi *et al.* (1982) for *L. indicus, P. indica, D. penetrans, I.raipurensis* and *L.indica.* Present finding is also the agreement of Skorping (1980) who reported significant difference in prevalence and mean intensity in male and female hosts. Sanaullah and Ahmed (1978) although did not find conspicuous variation in infection, it was observed that female hosts were more infected by caryophyllid cestodes.

Size differences were found to relevant to the prevalence and infection of *L. indicus.* Higher infection was significantly observed in larger groups. Distribution of the worm with respect to host size was similar to that observed for *Caryophyllaeus* and *Echinorhynchus* (Kennedy 1968, Awachie 1965). Prevalence and intensity of infection generally increased with host size up to a point and then declined (Stromberg and Crites 1975).

In the present study the infection of the parasite showed an overdispersion (variance > mean) distribution (Table 1). Stromberg and Crites (1975) stated that no precise mathematical functions could be defined for prevalence and intensity of infection of parasites in case of overdispersed population. Although the parasite *L. indicus* was present in the parasite throughout the year, there appeared a seasonal infection, invasion and maturation. The highest prevalence

occurred during August-September. This could be attributed to several factors including a large volume of parasites (maturing, matured) retained in the host for a longer duration. It also appeared that not all the parasites acquired maturity during summer months. Higher level infection was maintained from April to September. The observation on the maturation of *L. indicus* revealed that the fish becomes infected throughout the year, the period of infection appeared to be December-January and the large number of immature worms receive during these months to grow. Sanaullah and Ahmed (1978) suggested that the water temperature never falls below 4°C, even in the winter, thus making a suitable environment for infection by caryophyllid cestodes.

Conclusions

Lytocestus indicus is one of the most important caryophyllid cestodes of *C. batrachus* at Mymensingh. A seasonal cycle of its infection is found in the host. Spawning season of fish, water temperature and rainfall, availability of infected food organisms may be associated factors for its invasion, development and maturation. Winter period (December-January) appeared to be the recruitment period for this worm. In case of heavy infection it can cause serious injuries by its scolex penetration to fish intestine. Severe intestinal lesions, infiltration of leukocytes and hypertrophy and hyperplasticity of submucosa were observed by several authors (Ahmed and Sanaullah 1979, Agarwal 1985). Further works are therefore necessary for understanding the life cycle pattern, histopathology and its control measures.

Acknowledgements

The work was financed by ODA through BAU link project. Facilities provided by the Department of Fisheries Biology and Limnology is gratefully acknowledged.

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